

### AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the present application.

1. (Original) A method of grinding a ferrous roll having a rotating roll surface with a rotating grinding wheel, the ferrous roll having a hardness greater than 65 SHC and a minimum diameter of at least 10 inches and a length of at least 2 feet, the method comprising:

a) mounting a grinding wheel on a machine spindle and setting the angle between the grinding wheel rotational axis and roll rotational axis less than about 25 degrees;

b) bringing the rotating wheel into contact with a rotating roll surface and traversing the wheel across an axial roll length, while maintaining a ratio of axial taper tolerance (TT) to radial wheel wear compensation (WWC) of greater than 10; and

c) grinding the roll surface to a surface roughness  $R_a$  of less than 5 micrometer while leaving the roll surface substantially free of feed marks, chatter marks, and surface irregularities.

2. (Original) The method of claim 1, wherein the roll is ground to a surface roughness  $R_a$  of less than 3 micrometer.

3. (Cancelled).

4. (Original) The method of claim 1, wherein the ferrous roll surface is substantially free of thermal degradation of the roll material.

5. (Original) The method of claim 1, wherein the ratio of TT to WWC is greater than 25.

6. (Cancelled).

7. (Cancelled).

8. (Original) The method of claim 1, wherein said grinding wheel includes a layer comprising of a superabrasive material having a Knoop hardness greater than 3000 KHN, selected from the group of natural diamond, synthetic diamond, cubic boron nitride, and mixtures

thereof, with or without a secondary abrasive with Knoop hardness less than 3000 KHN, in a bond system.

9. (Cancelled).

10. (Currently Amended) The method of claim 9 8, wherein the superabrasive material comprises cubic boron nitride, and the amount of cubic boron nitride in said grinding wheel bond system is in the range of 10 to 60 volume %.

11. (Cancelled).

12. (Original) The method of claim 8, wherein the bond system is one of: a) a vitrified bond comprising at least one of clay, feldspar, lime, borax, soda, glass frit, fritted materials and combinations thereof; and b) a resin bond system comprising at least one of a phenolic resin, epoxy resin, polyimide resin, and mixtures thereof.

13. (Original) The method of claim 1, wherein the grinding wheel is rotated from 3600 to 12000 fpm.

14. (Original) The method of claim 1, wherein said method further comprises the step of removing stock off the ferrous roll in one pass or multiple passes.

15. (Cancelled).

16. (Cancelled).

17. (Cancelled).

18. (Original) The method of claim 1, wherein the grinding is carried out at a G ratio of at least 20.

19. (Original) The method of claim 1, wherein the grinding wheel has an axis of rotation that is substantially parallel to the rotational axis of the roll.

20. (Original) The method of claim 1, wherein said ferrous roll is a solid revolution having a surface geometry selected from one of: a convex crown, a concave crown, a continuous numerical profile, and a polynomial shape along the axis of the roll, ground to a form profile tolerance of less than 0.05 mm.

21. (Original) The method of claim 1, wherein said grinding wheel has a transverse rate of at least 50 mm/min.

22. (Original) The method of claim 1, wherein said grinding wheel removes a stock grind amount of less than about 0.2 mm from the minimum worn roll diameter.

23. (Cancelled).

24. (Cancelled).

25. (Cancelled).

26. (Cancelled).

27. (Original) A method of grinding a ferrous roll having a rotating roll surface with a rotating grinding wheel, the method comprising:

- a) mounting the grinding wheel on a machine spindle;
- b) bringing the rotating wheel into contact with the rotating roll surface and traversing the wheel across an axial roll length; and
- c) grinding the roll surface while maintaining at least one or both of said grinding wheel rotational speed and said mill roll rotational speed varied in an amount of +/- 1 to 40% in amplitude, with a period of 1 to 30 seconds.

28. (Original) the method of claim 27, wherein said wheel rotational frequency (rpm) is varied at an amplitude of +/- 20% with a period of less than 5 seconds.

29. (Currently Amended) The method of claim 27, wherein:  
the roll is ground to a surface roughness  $R_a$  of less than 3 micrometer;  
the roll surface is substantially free of thermal degradation of the roll material; and  
said grinding wheel includes a layer comprising of a superabrasive material having a  
Knoop hardness greater than 3000 KHN, selected from the group of natural diamond, synthetic  
diamond, cubic boron nitride, and mixtures thereof, with or without a secondary abrasive with  
Knoop hardness less than 3000 KHN, in a bond system.

30. (Cancelled).

31. (Currently Amended) The method of ~~claim 27~~ claim 27, wherein the a ratio of TT to WWC is greater than 25.

32. (Original) The method of claim 27, wherein the roll has a diameter of at least 18 inches and a length of at least 2 feet.

33. (Cancelled).

34. (Cancelled).

35. (Currently Amended) The method of claim ~~34~~ 29, wherein the superabrasive material  
comprises cubic boron nitride, and the amount of cubic boron nitride in said grinding wheel bond system is in the range of 10 to 60 volume %.

36. (Currently Amended) The method ~~of claim 3330~~, wherein the bond system is one of: a) a vitrified bond comprising at least one of clay, feldspar, lime, borax, soda, glass frit, fritted materials and combinations thereof; and b) a resin bond system comprising at least one of a phenolic resin, epoxy resin, polyimide resin, and mixtures thereof.

37. (Currently Amended) The method of claim 27, wherein;  
the grinding wheel is rotated from 3600 to 12000 fpm;  
the grinding is carried out at a G ratio of at least 20;  
the grinding wheel has an axis of rotation that is substantially parallel to the rotational  
axis of the roll; and  
said grinding wheel removes a stock grind amount of less than about 0.2 mm from the  
minimum worn roll diameter.
38. (Cancelled).
39. (Cancelled).
40. (Cancelled).